

MUNICIPAL & UNIVERSITY STORMWATER PROGRAM PARTNERSHIP

LEXINGTON
MASSACHUSETTS

UNIVERSITY of MASSACHUSETTS
LOWELL



CREATING A UNIVERSITY IDDE PROGRAM



UNIVERSITY STUDENTS



Prof. Edward L. Hajduk, D.Eng, PE
Faculty Advisor
UMass Lowell ASCE Student Chapter



CREATING A UNIVERSITY IDDE PROGRAM



INTERN CLASSROOM TRAINING SESSION AT
LEXINGTON DPW



INTERN FIELD TRAINING
IN LEXINGTON

CREATING A UNIVERSITY IDDE PROGRAM

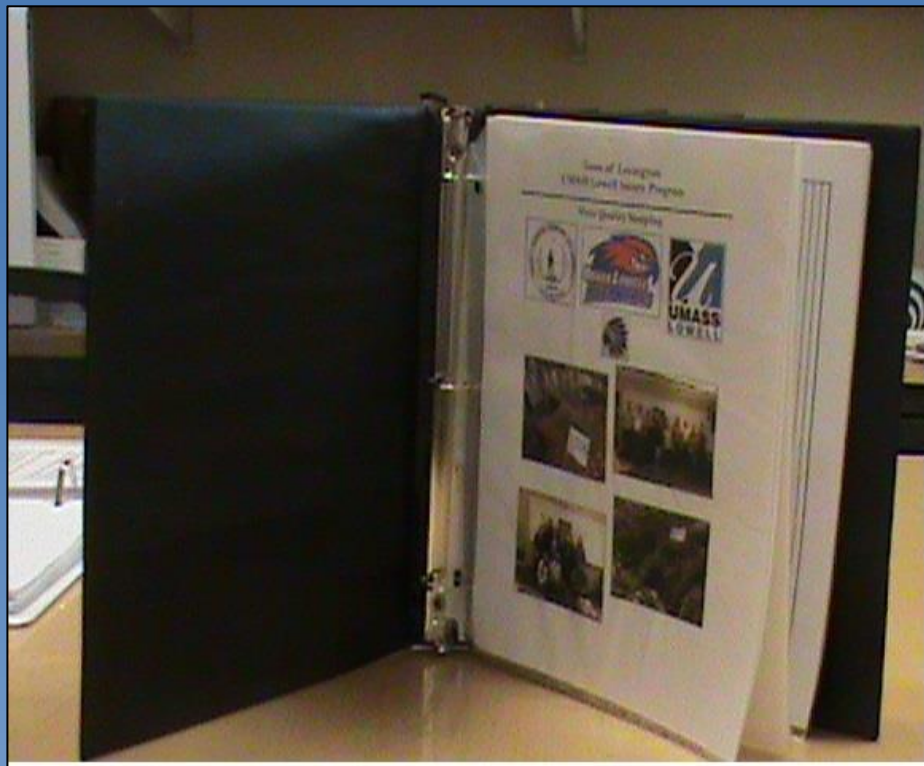
Safety Training is an important part of the program from the beginning

- Always work in teams
- Safety lesson on working near water
- Tick education
- Emergency protocol training



MANAGING A UNIVERSITY IDDE PROGRAM

INTERN FIELD BINDER WITH DETAILED SAMPLING INSTRUCTIONS



BINDER ALSO HAS OUTFALL PHOTO, OUTFALL MAPS, DATA SHEETS AND LETTER FROM TOWN

Ammonia and Chlorine Water Quality Sampling Protocol Lexington Watershed Stewardship Program Revised January 2, 2014

Step 1. Collect water sample

- Select a sample location as close to the pipe as possible.
- Submerge dipper 6 inches below water surface (if possible) to fill dipper, then pour out water on bank. This is to rinse the dipper.
- Submerge dipper 6 inches below water surface again to retrieve sample.
- Place filled dipper on bank or in a convenient location for conducting tests.



Step 2. Take water temperature

- As soon as possible, take temperature of sample in dipper by inserting temperature probe into water and holding until steady temperature reading appears.
- Record temperature on data sheet in degrees Fahrenheit.



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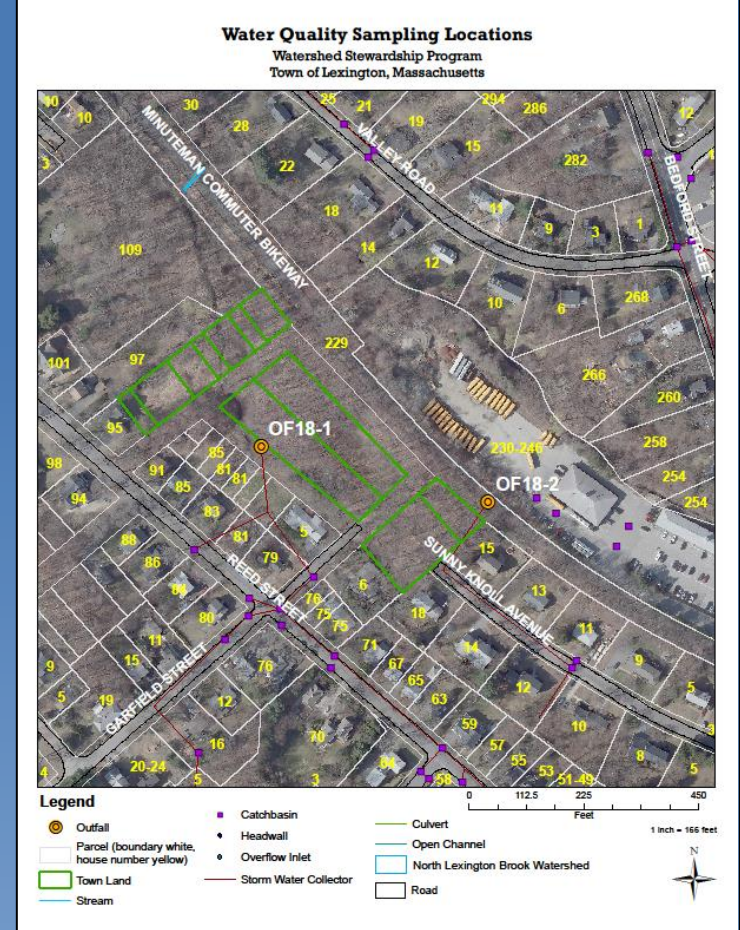
INTERN SAMPLING PROTOCOL



MANAGING A UNIVERSITY IDDE PROGRAM



OUTFALL PHOTO



OUTFALL MAP



MANAGING A UNIVERSITY IDDE PROGRAM



Town of Lexington
Department of Public Works
Engineering

John R. Livsey, P.E.
Town Engineer

Tel: (781) 274-8305
Fax: (781) 274-8385


Dear Neighbor,

Interns working with the Lexington Engineering Division are conducting water quality sampling to help improve stormwater quality in Lexington. Teams are made up of 2 or more students from the University of Massachusetts at Lowell (UML). The UML stream teams will take water samples from pipes that drain into our brooks and streams. This program is vital in our efforts to clean up the streams and brooks of Lexington. At times, these interns need to access drainage easements to evaluate discharge into streams. This may entail passing by or through your land.

If you have concerns, please contact:

Dave Pavlik
Town of Lexington Engineering Division
201 Bedford Street
Lexington, MA 02420
781.274.8309
dpavlik@lexingtonma.gov

Thank You


John R. Livsey, P.E.
Town Engineer

201 BEDFORD STREET • SAMUEL HADLEY PUBLIC SERVICES BUILDING • LEXINGTON, MASSACHUSETTS 02420



OFFICIAL LETTER AND ID BADGES



TASKS OF A UNIVERSITY IDDE PROGRAM



OUTFALL RECONNAISSANCE & INVENTORY

UMASS
LOWELL
STREAM TEAM

Section 1: Background Data

Sub watershed: Vine Brook	Outfall ID: OF 14-2
Today's Date: 5/12/14	Time: 1015
Investigators: DP, JL	Form Completed by: DP
Temperature (Air): 67	Rainfall (in.) last 24 hours: 0.12

Section 2: Photo Inventory

Photo of Outfall taken:	<input checked="" type="radio"/> YES	<input type="radio"/> NO
If yes email to stormwater@lexingtonma.gov		
If no, why no photo?		

Section 3: Outfall Description - Pick one type (a or b), then circle appropriate descriptors.

Type	Material	Shape	Diameter (IN.)	Submerged
a. Closed Pipe	Concrete	Corrugated	4	In Water: No Partially Fully
	Plastic	Metal	6	
	Steel	Black Plastic	8	
	Other:	Other:	12	
			18	
b. Open drainage	Concrete	Trapezoid	Depth:	In Sediment: No Partially Fully
	Earthen	Parabolic	Top Width:	
	Rip-Rap	Natural channel	Bottom Width:	
	Other:	Other:		

Section 4: Water Flow Parameters

Flow Present?	<input checked="" type="radio"/> Yes	<input type="radio"/> No
Flow Description (If Present)	Trickle	<input checked="" type="radio"/> Moderate
		Substantial

Section 5: Water Quality Parameters

Time	Clarity	Color	Odor	Temp (F) *	DO (mg/l)*	SP Cond*(µmhos/cm)	Ammonia test strip (mg/l)	Samples for lab†
1030	Clear	Clear	None	58	8.5	750	0.25	E,A,S
Water Quality Parameters to be used for description in above column								
Clarity	Clear	Cloudy						
Color	Clear	Gray	Light Tea	Light Green	Tea	White	Other	
Odor	None	Musty	Fishy	Oily	Organic	Sewage	Rotten Eggs	
Samples for the lab Abbreviations								
A=Ammonia E = E. coli, S=Surfactant, FC = Fecal Coliform, TP = Total Phosphorus,								
*Record Values from YSI meter								

Section 6: Comments



TASKS OF A UNIVERSITY IDDE PROGRAM

TOWN OF LEXINGTON

SAMPLE COLLECTION DATA SHEET

UMASS LOWELL
STREAM TEAM

Sub watershed: Vine brook	Date: 6/5/14	Investigators: DP,MS
Temperature (Air)-F*: 70	Rainfall (in.) last 24 hours: 0.2	Form Completed by: MS

SAMPLE LOCATION:	Time	Flow Present? (Y/N)	Flow Description	Clarity	Color	Odor	Temp (F) *	DO (mg/l)*	SP Cond*(µmhos/cm)	Chlorinex	Ammonia test strip (mg/l)	Samples for lab†
OF 15-30	1030	Y	Moderate	Clear	Clear	None	68	8.56	750	0.03	0.25	E,A,S

Key for data collection

Water Flow Parameters to be used above				†Samples for the lab Abbreviations to be used above			
Flow Present?	Yes	No		E = Ecoli	FC = Fecal Coliform	A=Ammonia	
Flow Description	Trickle	Moderate	Substantial	TP = Total Phosphorus		S=Surfactant	

Water Quality Parameters to be used above								
Clarity	Clear	Cloudy						
Color	Clear	Grey	Tea	Light Green	White	Other		
Odor	None	Musty	Fishy	Oily	Organic	Sewage	Rotten Eggs	Other

*Record Values from YSI meter for Temp, DO & Conductivity ×Record number from colorimeter

Comments or unusual flow observations



TIME COMMITMENTS FOR A UNIVERSITY IDDE PROGRAM



PROGRAM KICK OFF WITH A TWO HOUR TRAINING SESSION



TIME COMMITMENT FOR A UNIVERSITY IDDE PROGRAM

Program management

- **Work closely with student project manager**
- **Preparation time for restocking kit**
- **Preparation time for sample bottles**
- **Coordinating field work with students and lab**
- **Time commitment for quality assurance of work**



TIME COMMITMENTS FOR A UNIVERSITY IDDE PROGRAM

Program results

- **Work with students sharing data to online spreadsheet**
- **Analysis of data**
- **Evaluation of outfall data**



TIME COMMITMENT FOR A UNIVERSITY IDDE PROGRAM

Classroom and field refresher training



REFRESHER TRAINING SESSION AT UNIVERSITY PROGRAM IMPROVEMENTS & FIELD TRAINING



FINANCIAL COMMITMENT OF A UNIVERSITY IDDE PROGRAM

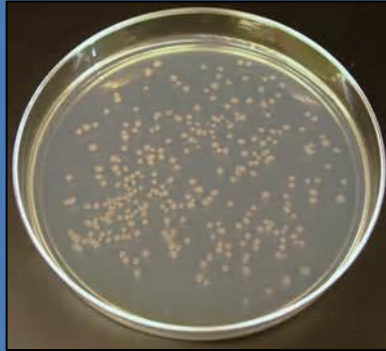


FIELD KITS OUTFALL SCREENING AND INVENTORY



FINANCIAL COMMITMENT OF A UNIVERSITY IDDE PROGRAM

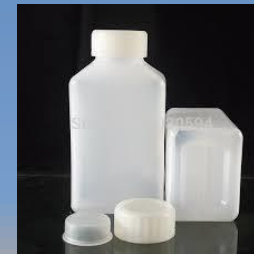
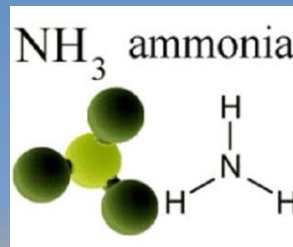
ECOLI



SURFACTANTS



AMMONIA



LAB SAMPLING


FINANCIAL COMMITMENT OF A UNIVERSITY IDDE PROGRAM



MULTIMETER FOR SAMPLING



TAKING MEASUREMENTS AND STORING DATA WITH THE YSI

1. Press  to turn the instrument on. The instrument will be in Run mode and begin sampling but not recording.
2. To begin recording, insert the entire probe past the orange marker. Shake the probe in the sample to release any air bubbles and wait until the temperature and DO stabilize. The YSI will beep and the AS symbol next to the DO readings will be solid once it has stabilized.
3. To begin recording data on the YSI, highlight **Log One Sample** and press ENTER. **Log One Sample** is already highlighted when the instrument is turned on. A submenu will open at the top of the screen. Highlight **Sites** and press ENTER. Select the outfall to be sampled and press ENTER. Then highlight **Folders** and select the subwatershed and press ENTER.
4. Then highlight **Log Now** and press ENTER. If there is no flow, gently move the probe in a stirring motion to provide movement for measuring DO.
5. The instrument will confirm that the data point was logged successfully on the YSI, with a beep and solid AS symbol next to the DO and SPC readings.
6. Record the Temp. (°F), DO (mg/L), and Conductivity (µS/cm) on the Sample Collection data sheet.
7. Once sampling is complete remove the probe from the water and turn off the instrument. Then lightly shake off the probe to remove excess water. Place the transport sleeve over the probe and return the instrument to the carrying case.

MULTIMETER INSTRUCTION PROVIDED
WITH INTERN BINDER

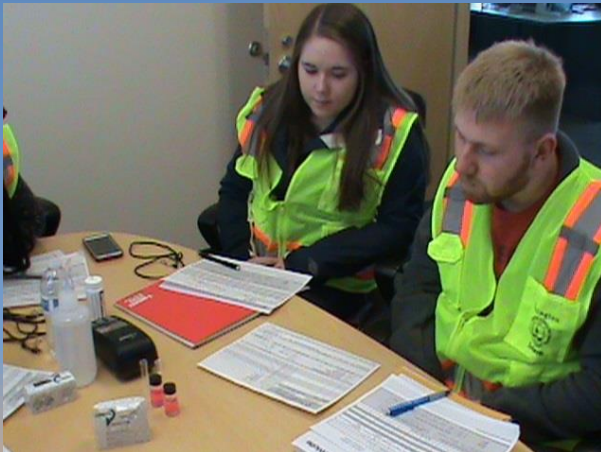


FINANCIAL COMMITMENT OF A UNIVERSITY IDDE PROGRAM





Chlorine
17
Cl
35.453


COLORIMETER FOR CHLORINE



PROCEDURE FOR FREE CHLORINE WITH THE COLORIMETER

1. Press and hold  until colorimeter turns on.
2. Press  to select TESTING MENU.
3. Select ALL TESTS (or another sequence containing 014 Chlorine) from TESTING MENU.
4. Scroll to and select 014 Chlorine from menu.
5. Rinse a clean tube (0290) with sample water. Fill to the 10 mL line with sample.
6. Insert tube into chamber, close lid and select SCAN BLANK.
7. Remove tube from colorimeter. Add one *Chlorine DPD #1 Instrument Grade Tablet (6903A). Cap tube and shake for 10 seconds. Invert slowly 5 times. Solution will turn pink if free chlorine is present.
8. Immediately insert tube into chamber, close lid and select SCAN SAMPLE.

Procedure for Combined Chlorine

9. Add one Chlorine DPD #3 instrument grade tablet to sample from step 8 above. Cap tube and shake for 10 seconds. Invert slowly 5 times. An increase in color represents combined chlorine.
10. Insert sample into chamber, close lid and select SCAN SAMPLE. Record result as Total Chlorine.
11. You can subtract free chlorine from total chlorine readings to obtain concentration of combined chlorine.
12. Press  to turn off the colorimeter.

COLORIMETER TESTING INSTRUCTION PROVIDED WITH INTERN BINDER



BENEFITS TO A UNIVERSITY IDDE PROGRAM

Benefits to the municipality

- **Public outreach credit for your MS4 permit**
- **IDDE Compliance for your MS4 permit**
- **Improved water quality in your community**
- **Community recognition**
- **Opportunity to give back to future engineers**



BENEFITS TO A UNIVERSITY IDDE PROGRAM

Benefits to students

- Exposure to Environmental Issues
- Hands on experience
- Professional Development
- Networking Opportunities
 - With Professionals
 - With other Students
- Internship opportunities
- Learning to work with Professional Engineers and other students in a team
- Community Service Experience



STREAM TEAM MEMBERS WORKING ON
OUTFALL INVENTORY IN MILL BROOK



LATEST IMPROVEMENTS AND FUTURE ASPIRATIONS

- Increase student involvement
- Expand testing parameters
- Acquire new equipment
- Lab tours
- Expansion to other nearby communities (e.g. Woburn)
- Spread awareness of the need for developing municipal partnerships for IDDE programs



STREAM TEAM MEMBERS USING
COLORIMETER AT OUTFALL SAMPLING IN VINE
BROOK

SUCCESS OF PROGRAM

- **“STORMY” Award-** Best Stormwater Idea in New England at the Spring 2015 NEWWA Conference
- The “STORMY” Award is given by the New England Stormwater Collaborative and recognizes simple, imaginative, and inventive ways that New England communities are increasing staff capacity, funding, or political support for stormwater management programs.



STORMY ACCETANCE



SUCCESS OF PROGRAM

- **BEST POSTER AWARD-** UMass Lowell Undergraduate Research Symposium
- Created, printed, and presented a poster about the Town of Lexington Stormwater Monitoring Project to a panel of judges
- One of 4 posters selected for the award from the College of Engineering



POSTER PRESENTATION

SUCCESS OF PROGRAM

- **OUTSTANDING COMMUNITY SERVICE AWARD** to the UMass Lowell ASCE Student Chapter out of all Student Organizations at the University
- Students at UMass Lowell sent in written submissions that were reviewed by judges
- The Town of Lexington Stormwater Monitoring Project is one of four community service projects that the UML ASCE club runs



COMMUNITY SERVICE AWARD





CITY OF WOBURN MS-4 STORMWATER MANAGEMENT PROGRAM

PROJECT MANAGERS: REBECCA GONSALVES-LAMONTAGNE &
STEPHANIE COLLINS

CITY ENGINEER: JOHN E. COREY, JR. P.E.

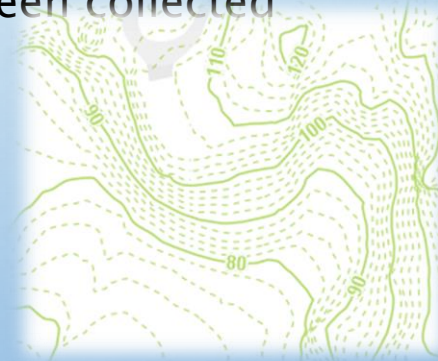
TRIBUTARY AREA DELINEATION



Contours at Horn Pond

- Students will learn the basics of contour mapping and then use the contour lines to determine drainage areas
- All work will be checked by city engineers to assure accuracy

- Teams will work in one drainage area at a time, moving onto the next once all testing is completed in the first area and if city engineers feel a sufficient number of data points have been collected



DRAINAGE SYSTEM CONNECTIVITY

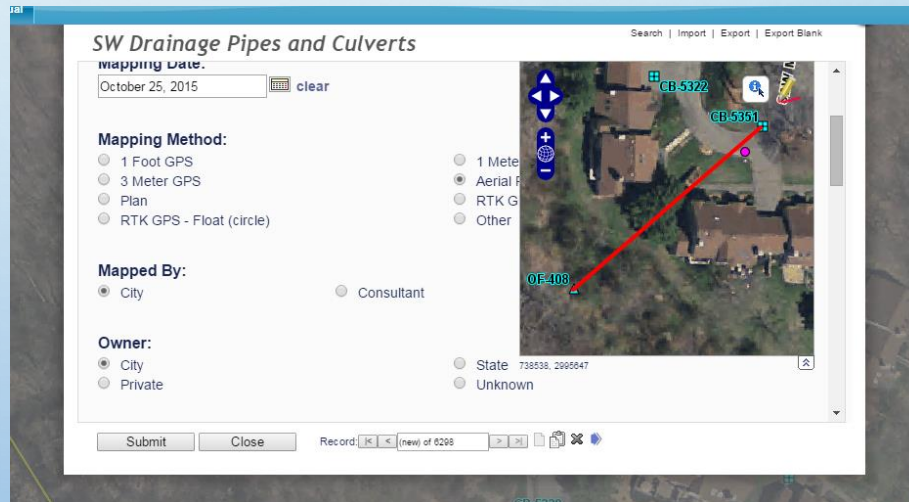


Connected Drainage



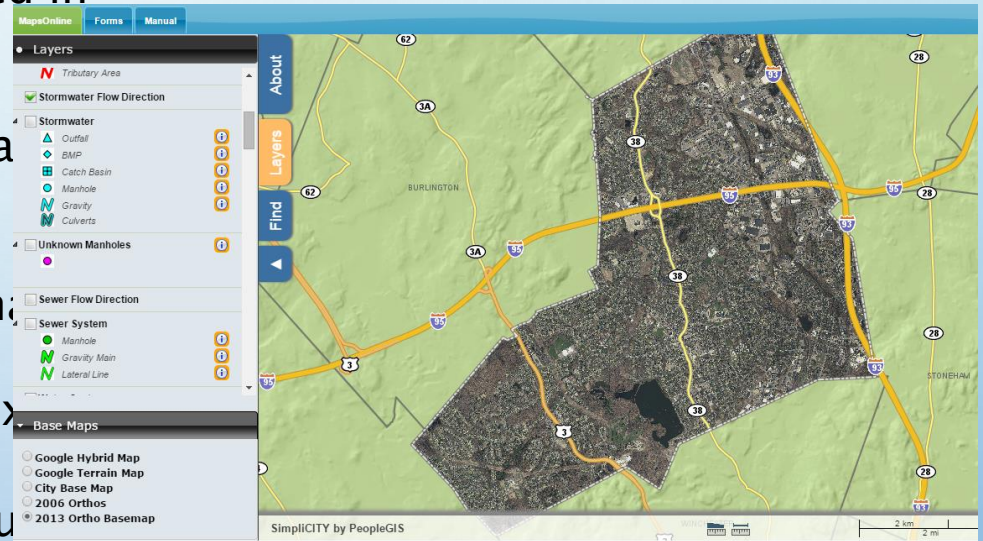
Unconnected Drainage

- PeopleGIS allows for quick and accurate mapping of the drainage system
- Drainage will be connected using information in the Engineering office



OUTFALL AND DRAINAGE MAPPING

- Drainage and outfalls can be mapped in the field as they are discovered
- City Engineers can monitor the updates to the map in real-time
- PeopleGIS provides an interactive map accessible to anyone and found at: www.mapsonline.net/woburnma/index
- This also assists the city with cleaning and repairs to the drainage system as this information will continually be updated over the life of the program



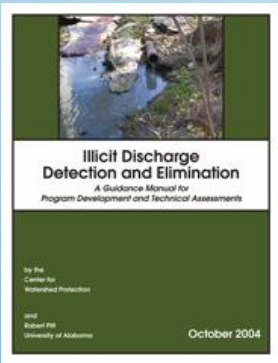
City of Woburn's PeopleGIS Stormwater homepage

OUTFALL SAMPLING AND TESTING



Commerce Way Outfall

- Teams will field-test for ammonia, total chlorine, conductivity, D.O., surfactants, salinity and temperature
- All testing results, outfall photos, and pertinent information is logged in GIS



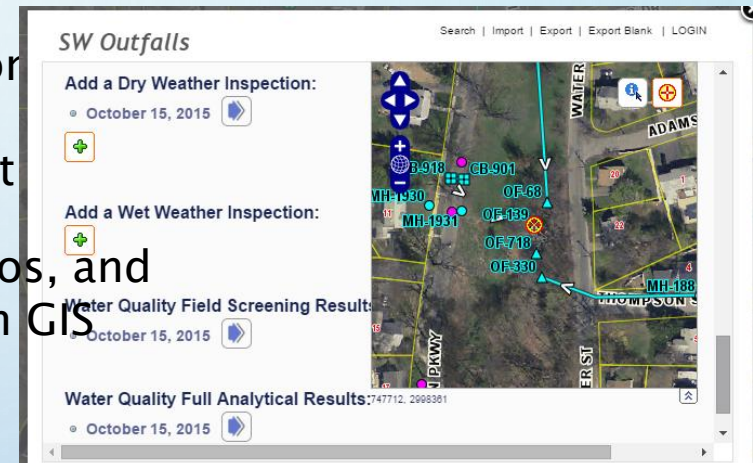
Chapter 11: Outfall Reconnaissance Inventory

SW Water Quality Field Screening Form

FIELD SCREENING	
Ammonia	
Boron	
Chloride	
Color	
Specific Conductance	
Detergents & Surfactants	
Fluoride	
Hardness	
pH	
Potassium	
Turbidity	

Comments:
Temperature: 59.4°F

Submit Cancel Record 1 of 4



- Field tests will be performed with a variety of instrumentation including a Hach Pocket Colorimeter II and meter.

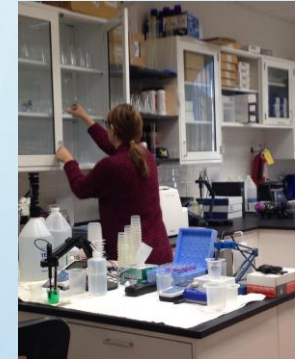
LABORATORY TESTING

Students will learn and perform the following:

- *E. coli* and 5 day BOD tests in the lab
- pH test with the Hach probe and meter
- IDEXX Colilert EPA approved 24 hour test to test for *E. coli* in the city's non-distressed waters



Woburn Water Treatment Plant & Laboratory



Colorimeter and Hach Probes



Colilert sample bottles & trays

WOBURN'S FUTURE IN STORMWATER MANAGEMENT

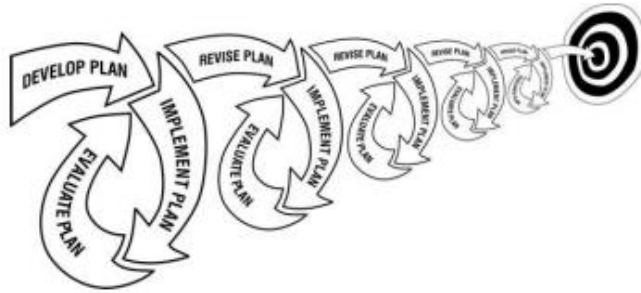


Figure 1. The iterative process of stormwater management (Develop, implement, evaluate, repeat).

From "Evaluating the Effectiveness of Municipal Stormwater Programs", EPA January 2008

- Improve public outreach
- Adapt to new drafts of the permit quickly
- Introduce more students to stormwater management and Illicit Discharge Detection and Elimination Program
- Work toward getting students school credit for participating in the program
- Continually evaluate and modify the program to insure its success and effectiveness
- Assist Lexington in spreading this program to other communities

MUNICIPAL & UNIVERSITY STORMWATER PROGRAM PARTNERSHIP

***Thank you for your interest in
our program***

***We now have time for
your questions***

